CLAIMS

1. A fuel cell system, comprising:

a fuel cell stack comprising a plurality of fuel cells, a fuel passage for directing a fuel stream through the plurality of fuel cells, and an oxidant passage for directing an oxidant stream through the plurality of fuel cells; and

a controller configured to temporarily increase the oxidant stream flow rate through the oxidant passage for a resuscitation duration, if the performance of at least one fuel cell in the fuel cell stack falls below a defined threshold value.

2. The fuel cell system of claim 1, further comprising a purge valve coupled to the fuel passage, wherein the controller is coupled to the purge valve and configured to open the purge valve for a purge duration if the performance of at least one fuel cell in the fuel cell stack falls below the defined threshold value.

3. The fuel cell system of claim 2, further comprising a sensor for monitoring a voltage across at least one pair of fuel cells in the fuel cell stack, and wherein the controller is configured to open the purge valve for the purge duration and to increase the oxidant stream flow rate through the oxidant passage of the fuel cell stack for the resuscitation duration, if the cell voltage across a monitored pair of fuel cells is less than a threshold voltage.

4. The fuel cell system of claim 3, further comprising:

an air compressor in fluid communication with the oxidant passage for delivery of oxidant air therethrough and coupled to the controller for control thereby.

5. The fuel cell system of claim 4 wherein the controller is configured to increase the air flow rate while the purge valve is open.

6. The fuel cell system of claim 1, further comprising:

an air compressor in fluid communication with the oxidant passage for delivery of oxidant air therethrough and coupled to the controller for control thereby, wherein the controller is configured to temporarily increase the oxidant stream flow rate by increasing a duty cycle of the air compressor by approximately 50 percent.

7. The fuel cell system of claim 1, further comprising:

an air compressor in fluid communication with the oxidant passage for delivery of oxidant therethrough and coupled to the controller for control thereby, wherein the controller is configured to temporarily increase the oxidant air flow by increasing a duty cycle of the air compressor by approximately 50 percent for a resuscitation duration of approximately 5 seconds.

8. The fuel cell system of claim 1 wherein the controller is further configured to restore the oxidant stream flow rate for an inter-resuscitation period, immediately following the resuscitation duration, and to shut down fuel cell operation if the performance of at least one fuel cell in the fuel cell stack is below a defined threshold value during the inter-resuscitation period.

9. The fuel cell system of claim 2 wherein the purge duration and the resuscitation duration are the same, and the controller is further configured to close the purge valve for an inter-resuscitation period immediately following the purge duration, and to shut down fuel cell operation if the performance of at least one fuel cell in the fuel cell stack is below a defined threshold value during the inter-resuscitation period.

10. A resuscitation system for use with a fuel cell assembly, comprising:

a purge valve couplable to a fuel passage of a fuel cell stack;

an oxidant flow device couplable to an oxidant passage of the fuel cell stack to provide an oxidant stream flow through the fuel cell stack; and

a controller coupled to the purge valve and the oxidant flow device and configured to open the purge valve for a purge duration and to increase the oxidant stream flow rate from the oxidant flow device source through the stack for a resuscitation duration, if the performance of at least one fuel cell in the fuel cell stack is below a defined threshold value.

11. The resuscitation system of claim 10, further comprising a sensor for monitoring a voltage across at least one pair of fuel cells in the fuel cell stack, and wherein the controller is configured to open the purge valve for a purge duration and to increase oxidant stream flow rate through the stack for a resuscitation duration, if the cell voltage across a monitored pair of fuel cells is less than a defined threshold voltage.

12. The resuscitation system of claim 11 wherein the oxidant flow device comprises an air compressor coupled to the controller for control thereby.

13. The resuscitation system of claim 11 wherein the controller is configured to increase the oxidant flow rate while the purge valve is open.

14. The resuscitation system of claim 11 wherein the oxidant flow device comprises an air compressor and the controller is configured to increase the air flow rate by increasing a duty cycle of the air compressor by approximately 50 percent.

15. The resuscitation system of claim 11 wherein the oxidant flow device comprises an air compressor and the controller increases the air flow rate by increasing a duty cycle of the air compressor by approximately 50 percent for a resuscitation duration of approximately 5 seconds.

16. The resuscitation system of claim 11 wherein the controller is further configured to close the purge valve for an inter-resuscitation period, immediately following the purge duration.

17. The resuscitation system of claim 11 wherein the controller is further configured to close the purge valve for an inter-resuscitation period immediately following the purge duration, and to shut down fuel cell operation if the performance of at least one fuel cell in the fuel cell stack is below a defined threshold value during the inter-resuscitation period.

18. A method of operating a fuel cell system, comprising:

determining the voltage across at least one fuel cell in a fuel cell stack;

opening a purge valve connected to a fuel passage of the fuel cell stack for a purge duration if the voltage across at least one fuel cell is less than a defined threshold voltage, and

increasing an oxidant stream flow rate through an oxidant passage of the fuel cell stack for the purge duration, if the voltage across at least one fuel cell is less than the defined threshold voltage.

19. The method of claim 18 wherein the voltage is determined across at least one pair of fuel cells in the fuel cell stack, and the purge valve is opened and the oxidant stream flow rate is increased if the voltage across a pair of fuel cells is less than a defined threshold voltage.

20. The method of claim 19, further comprising:

ceasing fuel cell operation if a voltage across at least one pair of fuel cells is less than a defined threshold voltage during an inter-resuscitation period immediately following the purge duration.

21. A method of operating a fuel cell system, comprising:

(a) monitoring a parameter indicative of the performance of at least one fuel cell in a fuel cell stack; and

(b) temporarily increasing an oxidant stream flow rate through an oxidant passage of the fuel cell stack if the performance of the at least one fuel cell is below a defined threshold performance value.

22. The method of claim 21 wherein the oxidant stream flow rate is temporarily increased if the value of the monitored parameter is outside of a defined range.

23. The method of claim 21 wherein step (b) comprises temporarily increasing the oxidant stoichiometry.

24. The method of claim 21, further comprising:

(c) increasing a fuel stream flow rate through a fuel passage of the fuel cell stack, if the performance of the at least one fuel cell is below the defined threshold performance value.

25. The method of claim 24 wherein in step (a) the voltage across a pair of fuel cells in the fuel cell stack is monitored, and in steps (b) and (c), the fuel and oxidant stream flow rates are increased when the voltage across at least one pair of fuel cells in the fuel cell stack is less than a defined threshold voltage.

26. The method of claim 21 wherein increasing the oxidant stream flow rate through an oxidant passage of the fuel cell stack includes increasing a duty cycle of an air compressor coupled to the oxidant passage by approximately 50 percent.

27. The method of claim 21 wherein increasing the oxidant stream flow rate through an oxidant passage of the fuel cell stack includes increasing a duty cycle of an air compressor coupled to the oxidant passage by approximately 50 percent for a resuscitation duration of approximately 5 seconds.

28. The method of claim 21, further comprising:

(c) opening a purge valve connected to a fuel passage of the fuel cell stack for a purge duration, if the voltage across at least one fuel cell in the fuel cell stack is less than a defined threshold voltage.

29. The method of claim 28 wherein increasing the oxidant stream flow rate through an oxidant passage of the fuel cell stack includes increasing a duty cycle of an air compressor coupled to the oxidant passage while the purge valve is open.

30. The method of claim 21 wherein in step (b) the oxidant stream flow rate is increased for a resuscitation duration and the method further comprises shutting down fuel cell operation if the performance of the at least one fuel cell is below a defined threshold performance value during a defined inter-resuscitation period following the resuscitation duration.

31. The method of claim 21, further comprising:

(c) opening a purge valve connected to a fuel passage of the fuel cell stack for a purge duration, if the performance of the at least one fuel cell is below a defined threshold performance value;

(d) closing the purge valve for an inter-resuscitation period, immediately following the purge duration: and

(e) shutting down fuel cell operation if a voltage of at least one fuel cell is less than the defined threshold voltage during the inter-resuscitation period.

32. The method of claim 31 wherein in (c) the purge valve is opened if the voltage across at least one pair of fuel cells in the fuel cell stack is less than a defined threshold voltage for a pair of fuel cells.

33. A computer-readable media containing instructions to cause a processor to control operation of a fuel cell system, by:

determining if a voltage across at least one pair of fuel cells in a fuel cell stack is less than a defined threshold voltage;

opening a purge valve connected to a fuel passage of the fuel cell stack for a purge duration, if the voltage across at least one pair of fuel cells in the fuel cell stack is less than a defined threshold voltage for a pair of fuel cells; and

increasing an oxidant air flow rate through an oxidant passage of the fuel cell stack for a resuscitation duration, if the voltage across at least one of the pair of fuel cells in the fuel cell stack is less than the defined threshold voltage.

34. The computer-readable media of claim 33 wherein the computer-readable media comprises a memory structure of a microcontroller.

35. The computer-readable media of claim 33 containing instructions to cause a processor to control operation of a fuel cell system, further by:

closing the purge valve for an inter-resuscitation period, immediately following the purge duration.

36. The computer-readable media of claim 33 containing instructions to cause a processor to control operation of a fuel cell system, further by:

closing the purge valve for an inter-resuscitation period, immediately following the purge duration; and

shutting down fuel cell operation if a voltage across a pair of fuel cells is less than the defined threshold voltage during the inter-resuscitation period.

37. A method of operating a fuel cell system comprising:

supplying fuel to a fuel cell stack via a fuel passage of the fuel cell stack;

directing an oxidant stream through an oxidant passage of the fuel cell stack at a nominal air flow rate corresponding to the power output of the fuel cell stack; and,

intermittently temporarily increasing the oxidant air flow rate beyond the nominal air flow rate when the power output of the stack is below a defined threshold.

38. The method of claim 37 wherein intermittently temporarily increasing the oxidant air flow rate beyond the nominal air flow rate when the power output of the stack is below a defined threshold includes intermittently temporarily increasing the oxidant stoichiometry.

39. The method of claim 37, further comprising:

intermittently opening a purge valve connected to the fuel passage to purge at least some water from the fuel cell stack.

40. The method of claim 37 wherein the oxidant air flow rate is increased at periodic regular intervals.